CLAIMS:

1. An assembly for transferring current, the assembly comprising:

at least one electrically conductive slip ring;

at least one electrically conductive brush for supplying current to the at least one slip ring; and

at least one electric actuator for oscillating the position of the at least one brush with respect to the at least one slip ring.

2. The assembly of claim 1 wherein the at least one brush comprises a plurality of brushes coupled to a support frame.

3. The assembly of claim 2 wherein the slip ring is coupled to a rotor and further including an inverter for driving the at least one electric actuator, a speed sensor for sensing a speed of the rotor, and an inverter controller for using the sensed speed to generate a control signal for the inverter.

4. The assembly of claim 2 further including an inverter for driving the at least one electric actuator and a high voltage isolation transformer coupled between the inverter and the at least one electric actuator.

5. The assembly of claim 2 wherein the at least one electric actuator is oriented to provide azimuthal or axial motion.

6. The assembly of claim 2 wherein the at least one electric actuator is oriented to provide azimuthal and axial motion.

7. The assembly of claim 2 wherein the at least one electric actuator comprises at least two electric actuators positioned substantially symmetrically about the support frame.

8. The assembly of claim 2 wherein the at least one electric actuator comprises at least one induction motor including a stator having stator windings.

9. The assembly of claim 8 wherein the at least one induction motor comprises an arch induction motor.

10. The assembly of claim 8 wherein the support frame comprises a secondary of the induction motor.

11. The assembly of claim 8 wherein the at least one induction motor further includes a secondary attached to the support frame.

12. The assembly of claim 8 wherein the at least one induction motor includes a secondary and further including insulation between the stator and the secondary.

13. The assembly of claim 2 wherein the at least one electric actuator comprises at least one voice coil actuator mechanically coupled to the support frame.

14. An assembly for transferring current, the assembly comprising:

at least one electrically conductive slip ring;

a plurality of electrically conductive brushes for supplying current to the at least one slip ring, each of the electrically conductive brushes being coupled through an electrical connection to adjacent ones of the electrically conductive brushes through a common electrical interface;

at least one electrically conductive lead coupled to the common electrical interface;

a plurality of inductors, each situated on a respective one of the electrical connections.

15. The assembly of claim 14 wherein each of the inductors is positioned in a parallel current path for increasing a self inductance of the respective parallel current path by at least one order of magnitude.

16. The assembly of claim 15 wherein each one of the inductors has an inductance that is substantially equal to inductances of each of the other inductors.

17. The assembly of claim 14 wherein at least one of the inductors is situated closer to the at least one electrically conductive lead and has a higher inductance value than at least one other of the inductors situated farther from the at least one electrically conductive lead.

18. The assembly of claim 17 wherein each inductor comprises an adjustable variable inductance inductor.

19. The assembly of claim 18 wherein each inductor comprises a coil form, a winding wound on the coil form, and an adjustable position magnetic core.

20. The assembly of claim 19 further including a plurality of voice coil actuators for controlling the positions of the adjustable magnetic cores.

~~21. An assembly for transferring current, the assembly comprising:~~

a rotor shaft;

a rotor coupled to the rotor shaft;

a plurality of rotor winding regions each including respective rotor windings wound through the rotor;

a plurality of electrically conductive slip rings coupled to the rotor shaft;

rotor winding leads coupling the rotor windings to the slip rings, at least some of the rotor winding leads coupled directly to respective ones of the slip rings.

22. The assembly of claim 21 wherein each rotor winding lead couples each rotor winding directly to a respective one of the slip rings.

23. The assembly of claim 22 wherein each rotor winding lead couples each rotor winding directly to a unique respective one of the slip rings.

24. The assembly of claim 21 wherein at least some of the rotor slip rings comprise segmented rotor slip rings.

25. The assembly of claim 21 wherein multiple rotor winding leads are coupled to each of the slip rings in substantially evenly-spaced positions.

26. The assembly of claim 25 wherein at least one of the multiple rotor winding leads includes an inductor.

27. An assembly for transferring current, the assembly comprising:

at least one conductive slip ring;

a plurality of electrically conductive brushes for supplying current to the at least one slip ring; and

at least one electric actuator for oscillating the position of the brushes with respect to the at least one slip ring, the at least one electric actuator comprising at least one induction motor or at least one voice coil actuator mechanically coupled to the support frame.

28. The assembly of claim 27 wherein each of the brushes is coupled through an electrical connection to adjacent ones of the brushes through a common electrical interface, and further including:

at least one electrically conductive lead coupled to the common electrical interface; and

a plurality of inductors, each situated on a respective one of the electrical connections, at least one of the inductors being situated closer to the at least one electrically conductive lead and having a higher inductance value than at least one other of the inductors situated farther from the at least one electrically conductive lead.

29. A method for transferring current comprising using at least one electric actuator for oscillating the position of at least one electrically conductive brush with respect to at least one electrically conductive slip ring while the at least one electrically conductive brush supplies current to the at least one slip ring.

30. The method of claim 29 further including sensing a speed of a rotor coupled to the slip ring and using the sensed speed to control the at least one electric actuator.

31. The method of claim 29 wherein the at least one electric actuator comprises at least one induction motor.

32. The method of claim 29 wherein the at least one electric actuator comprises at least one voice coil actuator.

33. The method of claim 29 wherein using the at least one electric actuator for oscillating the position of at least one electrically conductive brush includes providing azimuthal or axial motion.

34. The method of claim 29 wherein using the at least one electric actuator for oscillating the position of at least one electrically conductive brush includes providing azimuthal and axial motion.

35. The method of claim 29 wherein using the at least one electric actuator for oscillating the position of at least one electrically conductive brush includes positioning at least two electric actuators substantially symmetrically about the at least one electrically conductive brush.

36. A method for fabricating an assembly for transferring current, the method comprising:

coupling a plurality of electrically conductive brushes for supplying current to at least one electrically conductive slip ring through a plurality of respective electrical connections to adjacent ones of the electrically conductive brushes through a common electrical interface;

coupling at least one electrically conductive lead to the common electrical interface;

situating a plurality of inductors, each on a respective one of the electrical connections.

37. The method of claim 36 wherein situating the plurality of inductors, each on a respective one of the electrical connections, comprises situating each of the inductors in a parallel current path for increasing a self inductance of the respective parallel current path by at least one order of magnitude.

38. The method of claim 37 wherein each one of the inductors has an inductance that is substantially equal to each of the other inductors.

39. The method of claim 36 wherein situating the plurality of inductors, each on a respective one of the electrical connections, comprises situating at least one of the inductors closer to the at least one electrically conductive lead than at least one other of the inductors, the at least one of the inductors having a higher inductance value than the at least one other of the inductors.

40. The method of claim 39 further including, after situating the plurality of inductors, adjusting an inductance of at least one of the inductors.

41. A method for fabricating an assembly for transferring current, the method comprising:

providing a rotor coupled to a rotor shaft and having a plurality of rotor winding regions each including respective rotor windings wound through the rotor, and a plurality of electrically conductive slip rings coupled to the rotor shaft; and

coupling at least some rotor winding leads from the rotor windings directly to respective ones of the slip rings.

42. The method of claim 41 wherein coupling the at least some rotor winding leads includes coupling each rotor winding lead directly to a respective one of the slip rings.

43. The method of claim 41 wherein coupling the at least some rotor winding leads includes coupling multiple rotor winding leads to each of the slip rings in substantially evenly-spaced positions.

44. An assembly for transferring current, the assembly comprising:

at least one electrically conductive slip ring;

at least one electrically conductive brush for supplying current to the at least one slip ring; and

at least one pressure actuator for oscillating the position of the at least one brush with respect to the at least one slip ring.

45. The assembly of claim 44 wherein the at least one brush comprises a plurality of brushes coupled to a support frame.

46. The assembly of claim 45 wherein the at least one pressure actuator comprises at least two pressure actuators positioned substantially symmetrically about the support frame.

47. The assembly of claim 44 wherein the at least one pressure actuator is oriented to provide azimuthal or axial motion.

48. The assembly of claim 44 wherein the at least one pressure actuator is oriented to provide azimuthal and axial motion.

49. The assembly of claim 44 wherein the at least one pressure actuator is at least one hydraulic actuator or at least one pneumatic actuator.